Electronic Version
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Claims

[c1] 1.A wet cleaning process comprising:
an oxidation step being performed in combination with a first means for reducing Cu deposition on a cathode-like copper wiring line of a Cu-dual damascene structure, wherein the first means for reducing Cu deposition on a cathode-like copper wiring line comprises a step of purging an inert gas during the oxidation process; and
an oxide etch step for washing away cupric oxide substances generated in the oxidation step by means of a cupric oxide cleaning solution.

[c2] 2. The process of claim 1 wherein the oxidation step is used to slightly oxidize a surface of a Cu wiring line in a dual damascene structure by utilizing a diluted H_2O_2 solution.

[c3] 3. The process of claim 1 wherein the cupric oxide cleaning solution comprises diluted HF, NH_4F, NH_2OH, or diluted HF/HCl.

[c4] 4. The process of claim 1 wherein the cupric oxide substances generated in the oxidation step are CuO_x and $Cu(OH)_2$.

[c5] 5. The process of claim 1 wherein the cathode-like copper wiring line is electrically connected with an N^+ diffusion region of a silicon substrate.

[c6] 6. The process of claim 1 wherein the first means for reducing Cu deposition on a cathode-like copper wiring line comprises adding a Cu corrosion inhibitor to the diluted H_2O_2 solution.

[c7] 7.The process of claim 6 wherein the Cu corrosion inhibitor comprises benzotriazole (BTA).

[c8] 8. The process of claim 1 wherein the first means for reducing Cu deposition on a cathode-like copper wiring line comprises reducing the H_2O_2 concentration of the diluted H_2O_2 solution to below 100:1 (v/v) of solvent to H_2O_2.

[c9] 9. The process of claim 1 wherein the first means for reducing Cu deposition on a cathode-like copper wiring line comprises lowering the temperature of the diluted H_2O_2 solution during the oxidation step to below 15°C.

[c10] 10.The process of claim 1 wherein the oxide etch step for washing away cupric oxide substances generated in the oxidation step is performed in combination with a second means for reducing Cu deposition on a cathode-

like copper wiring line, wherein the second means for reducing Cu deposition on a cathode-like copper wiring line comprises increasing the pH of the cupric oxide cleaning solution to above 7.